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A review of *Himalcercyon* stat. nov., with description of a new species from the Chinese Himalaya and an updated key to Asian genera of Megasternini (Coleoptera, Hydrophilidae)

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Abstract

Himalcercyon Hebauer, 2002 **stat. nov.** is elevated to genus rank based on the unique form of its mesoventral elevation. The genus is reviewed, redescribed, and illustrated in detail. Two species are recognized: *Himalcercyon mirus* (Hebauer, 2002) **comb. nov.** from Nepal and *H. franzi* **sp. nov.** from Chinese Himalaya (Xizang Autonomous Region). Both species are illustrated and diagnosed. An updated key to the Asian genera of the tribe Megasternini (Coleoptera, Hydrophilidae, Sphaeridiinae) is provided, along with the SEM micrographs of ventral morphology of these genera. New replacement name *Oreosternum* **nom. nov.** is proposed for *Oreocyon* Hebauer, 2002 which is preoccupied by *Oreocyon* Marsh, 1872 (Mammalia, Oxyenidae) and *Oreocyon* Krumbiegel, 1949 (Mammalia, Canidae).

Key Words

Asia, morphology, new replacement name, new species, new status, Oriental Region, Sphaeridiinae, taxonomy, Xizang, China

Introduction

Megasternini is the largest clade of terrestrial water scavenger beetles, containing approximately 580 described species currently classified in 52 genera (Jia et al. 2011, 2019; Ryndevich 2011; Short and Fikáček 2011; Fikáček et al. 2012a, 2013, 2015b; Fikáček and Rocchi 2013; Makhan 2013; Deler-Hernández et al. 2014; Arriaga-Varela et al. 2017, 2018a, b; Ryndevich and Prokin 2017; Ryndevich et al. 2017; Shatrovskiy 2017; Szczepański et al. 2018). Since the 1980s, 20 new genera of Megasternini have been described from the Afrotropical, Australian, Oriental, and Neotropical regions by Hansen (1989, 1990, 1999a), Hebauer (2002a, 2003), Fikáček et al. (2013), and Arriaga-Varela et al. (2018a). Nearly half of the described megasternine species are classified in the genus *Cercyon*. This led d'Orchymont (1942), Smetana (1978), and Hebauer (2002a, 2003) to divide *Cercyon* into numerous subgenera, 11 of which are currently considered valid (Hansen 1999b; Short and Hebauer 2006). However, most of these only contain one to a few species, and the majority of *Cercyon* species are still members of the nominotypical subgenus *Cercyon* s. str. A phylogeny of the Hydrophilidae based on molecular data from six genes (Short and Fikáček 2013), which included only four *Cercyon* species, indicated that *Cercyon* is very likely a polyphyletic genus. Moreover, preliminary studies have revealed that even some of the small subgenera are not monophyletic (e.g., Arriaga-Varela et al. 2018a). Additional studies are therefore necessary to establish a natural classification of the group and allow for reliable identification of genera and species.

The mountains on the southern margin of the Qinghai-Xizang (Tibetan) Plateau are known for their highly diverse and endemic faunas (e.g., Huang et al. 2007; Deng et al. 2020), of which terrestrial Hydrophilidae are a component. More than 80 species of terrestrial hydrophilid beetles have been reported from Nepal and Bhutan (Hansen 1999b; Hebauer 2002a, b), most of which are until now only known from the Himalayas. Recently, some of the species originally described from the Himalayas have also been recorded from the mountains in the Chinese provinces of Yunnan and Sichuan (e.g., *Cercyon divisius* Hebauer, 2002: Ryndevich et al. 2017), indicating that the mountain systems on southern and south-eastern margin of Qinghai-Xizang are interconnected, thus forming the so-called Sino-Himalayan subregion (for details see Procheş and Ramdhani 2012). Other species originally known from the Himalayas are widespread at high elevations on the Qinghai-Xizang Plateau (*C. berlovi* Shatrovskiy, 1999: Jia et al. 2011) and seem to be plateau endemics that reach lower altitudes at the margins of their range, which seems uncommon for endemics of the plateau (see, e.g., Angus et al. 2016).

Recently, we received a small sample of terrestrial hydrophilids from Motuo County, Xizang Autonomous Region, China, a region in the Himalayas at the southern margin of the Qinghai-Xizang Plateau. In contrast to the more northern regions of the Xizang Autonomous Region, Motuo County includes middle to low elevations and is affected by monsoon rains; it is, therefore, warmer and more humid than the main plateau areas. The material contained a species of the Megasternini which is unique in the morphology of its mesoventral plate. We originally considered it to be an undescribed genus, but a detailed survey of megasternine taxa described from the Himalaya region revealed that *Cercyon mirus* Hebauer, 2002 from Nepal, which was assigned to the monotypic subgenus *Himalcercyon* Hebauer, 2002 in the original description (Hebauer 2002a), shares the unusual mesoventral morphology with our specimens. Hence, we here redescribe *Himalcercyon* and elevate this subgenus to the rank of genus based on its unique ventral morphology; we (re)describe and illustrate both species. We also provide an updated key to the Asian genera of the Megasternini.

Material and methods

We examined the type series of *Cercyon mirus* and the small series (10 specimens) of the new species from Motuo County. Male genitalia of the holotypes of both species were examined and photographed in the original position (i.e. with the median lobe inserted in the tegmen). Due to the very limited material available, separation of the median lobe is not always easy and sometimes results in partial damage of some parts of the aedeagus. Genitalia were photographed in glycerol. The aedeagus of the holotype of *C. mirus* was subsequently embedded in a drop of alcohol-soluble Euparal resin on a piece of glass glued to a small piece of cardboard attached below the respective specimen. Habitus photographs were taken using a Canon D-550 digital camera with attached Canon MP-E65mm f/2.8 1–5 macro lens. Genitalia were photographed using a Canon D1100 digital camera attached to an Olympus BX41 compound microscope (*C. mirus*) or using an Olympus SZX7 stereomicroscope (new species); combined, focus-stacked images were made with Helicon Focus (Helicon Soft Ltd, Ukraine) software. Scanning electron micrographs of *C. mirus* and of the Asian genera of the Megasternini were taken using a Hitachi S-3700N environmental electron microscope at the Department of Paleontology, National Museum in Prague; SEMs of the new species were taken using a Phenom Prox scanning electron microscope in the Biological Museum of the Sun Yat-sen University. Images were combined into figures using Adobe Photoshop CS6. All original images, including additional views not presented in this paper, are included in the dataset submitted to the Zenodo archive (https://zenodo.org/ under https://doi.org/10.5281/zenodo.3693743. SEMs of the megasternine genera for the identification key are mostly based on specimens deposited in NMPC, except for rare genera (*Kahanga*, *Gillisius*) for which holotypes were examined.

Examined specimens are deposited in the following collections:

NMPC National Museum, Praha, Czech Republic (M. Fikáček);
SMNS Staatliches Museum für Naturkunde, Stuttgart, Germany (W. Schawaller);
SYSU Biological Museum, Sun Yat-sen University, China (F.-L. Jia).

Taxonomy

Himalcercyon Hebauer, 2002, stat. nov.

Figures 1–4

Cercyon (*Himalcercyon*) Hebauer, 2002: 39.

Type species. *Cercyon* (*Himalcercyon*) *mirus* Hebauer, 2002.

Diagnosis. Dorsal surface pubescent; anterior margin of clypeus rounded; frontoclypeal suture not forming transverse ridge between eyes; eyes small, separated 5–6× the width of one eye; prosternum strongly carinate medially, without ridge demarcating median portion from lateral portions (Figs 2D, 3B); antennal grooves distinct, well demarcated laterally, not reaching lateral margins of prothorax (Figs 2D, 3B); mesoventrite bearing hydrofuge pubescence; mesoventral elevation arrowhead-shaped, widely attaching metaventral process

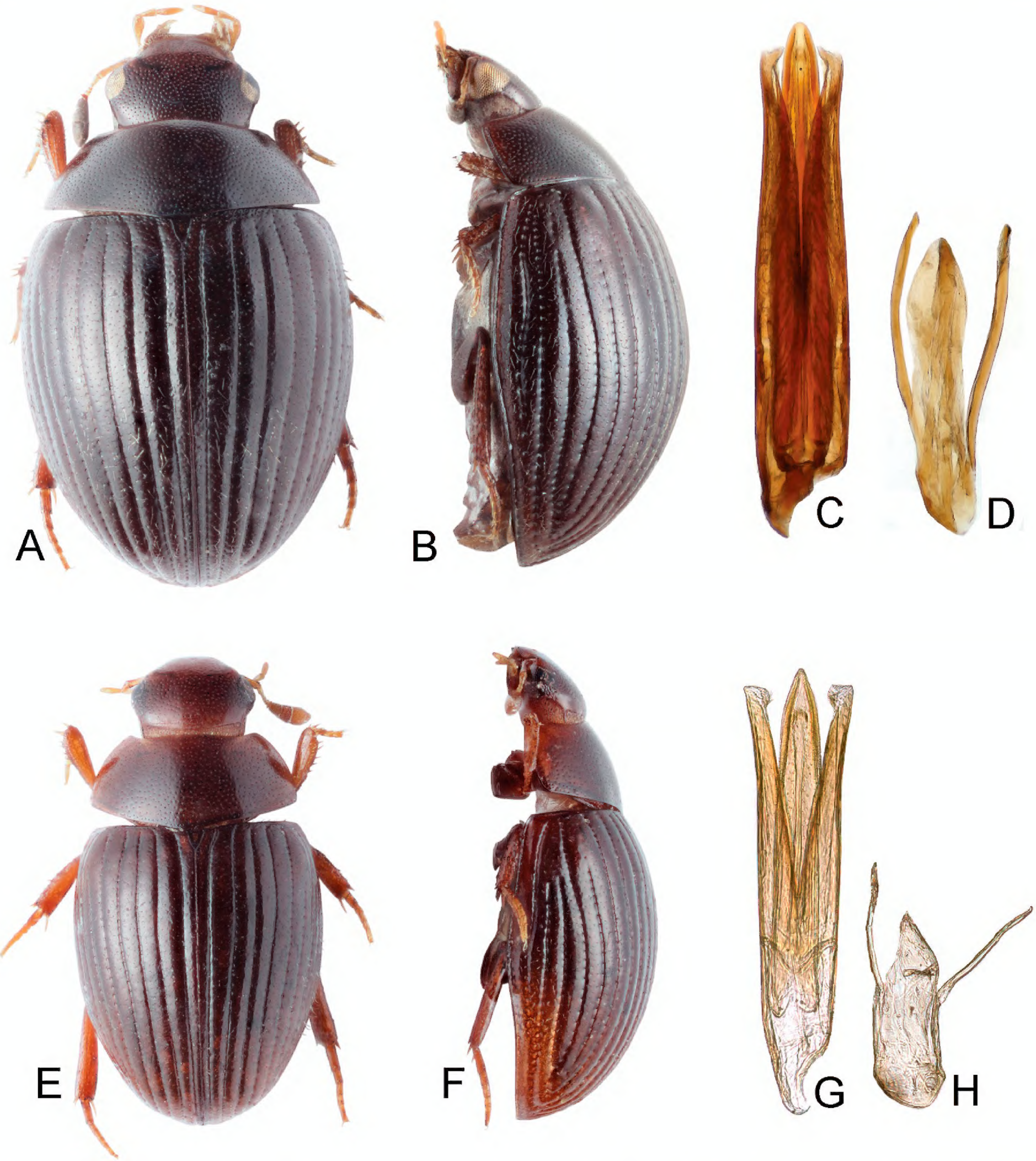

Figure 1. Habitus and genital morphology of *Himalcercyon* species. **A–D.** *H. mirus* (**A, B.** Paratypes; **C, D.** Holotype). **E–H.** *H. franzi* sp. nov. (**E, F.** Paratypes; **G, H.** Holotype). **A, E.** Dorsal view; **B, F.** Lateral view; **C, G.** Aedeagus in dorsal view; **D, H.** Sternite IX in dorsal view.

(Figs 2F, 3C), cavities for reception of procoxae ending far anterior to mesocoxae (Figs 2F, 3C); metaventrite with a pentagonal posteromedian glabrous area weakly projecting anteriorly between mesocoxae; femoral lines absent; anterolateral transverse arcuate ridge absent (Fig. 2E); each elytron with 10 striae (Figs 1A, B, E, F, 3H); first abdominal ventrite carinate throughout (Fig. 2A); last abdominal ventrite with a glabrous apical area (Fig. 2A); median lobe deeply inserted into phallobase (Fig. 1C, G); median portion of sternite IX tongue-shaped (Fig. 1D, H).

Redescription. Body broadly oval and moderately convex; body outline not interrupted between pronotum and elytra.

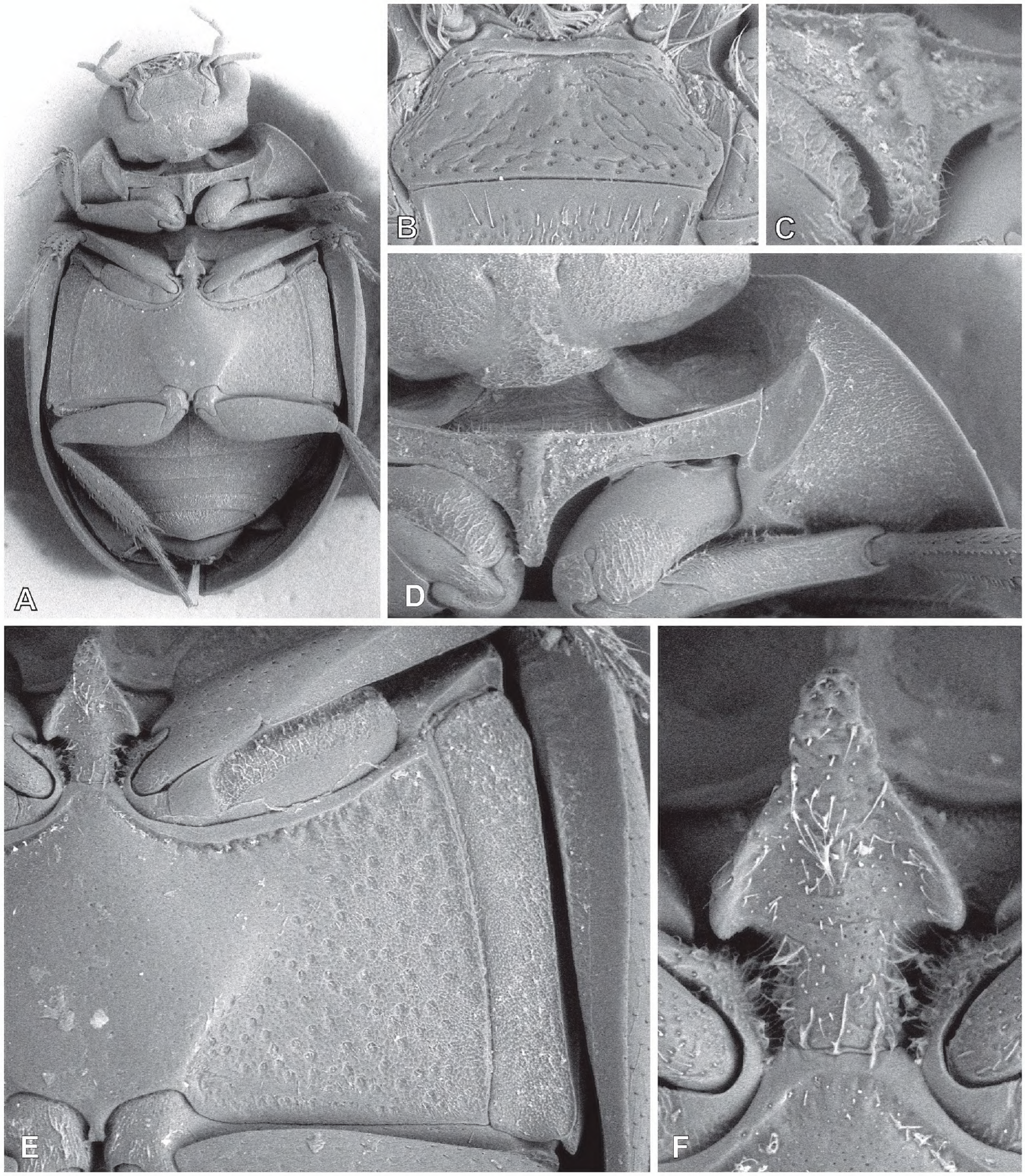

Figure 2. Morphology of *Himalcercyon mirus* (Hebauer, 2002). **A.** Complete ventral view. **B.** Mentum. **C.** Prosternal carina in ventrolateral view. **D.** Prosternum and hypomeron. **E.** Meso- and metaventrite. **F.** Details of mesoventral plate.

Head. Excised in front of eyes laterally, antennal base exposed. Labrum concealed under clypeus, not exposed dorsally. Clypeus not deflexed, truncate anteriorly, without anterolateral extensions; anterior margin narrowly beaded. Frontoclypeal suture obsolete, only visible as impunctate bar. Frons with even surface. Eyes rather small, rounded, projected laterally; interocular distance ca 5–6× the width of one eye in dorsal view. Dorsal punctation of head consisting of punctures each bearing a long seta. Maxillary palpus slightly longer than half of width of head, with ventral sucking disc in male; palpomere 2 strongly swollen, longer than palpomere 3; palpomere 4 symmetrical, slightly shorter than palpomere 2, but longer than palpomere 3. Men-

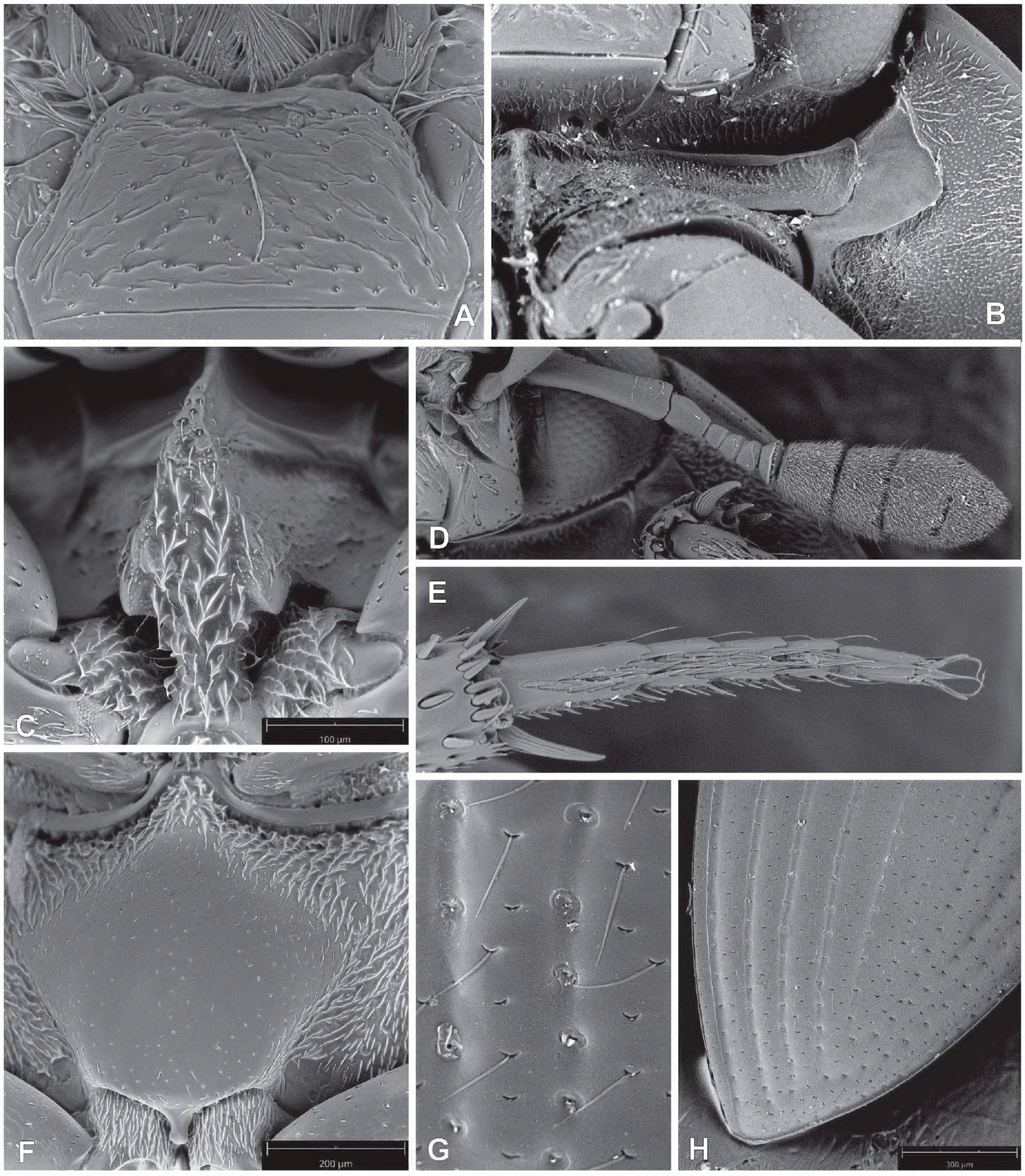

Figure 3. Morphology of *Himalcercyon franzi* sp. nov. **A.** Mentum. **B.** Prosternum and hypomeron. **C.** Mesoventral elevation. **D.** Antenna. **E.** Mesotarsus, ventral view. **F.** Median portion of metaventrite. **G.** Elytral punctation. **H.** Elytral apex.

tum ca 2.1–2.4× as wide as long, trapezoidal, anterior margin not emarginate medially (Figs 2B, 3A). Labial palpomere 3 slightly longer and as broad as palpomere 2, symmetrical. Gula well developed throughout, wide posteriorly, moderately narrowed anteriorly. Antennae with nine antennomeres, ca 0.7× width of head; scape a little longer than antennomeres 2–6 combined; club compact, pubescent, ca 2× as long as wide (Fig. 3D), slightly longer than scape.

Prothorax. Pronotum relatively short and transverse, widest at base; surface smooth, punctation consisting of setiferous punctures, all punctures of the same size and shape; transverse series of punctures along posterior margin absent. Prosternum well developed, slightly tec-

tiform, strongly carinate medially, without elevated median portion or ridge demarcating median portion from lateral parts (Figs 2D, 3C); antennal grooves distinct, well demarcated, arcuate laterally, not reaching lateral margins of prothorax (Figs 2D, 3B). Prosternal process reaching midpoint of procoxae, not bifurcate apically (Fig. 2D).

Mesothorax. Mesoventrite fused to mesepisterna, bearing hydrofuge pubescence; median portion abruptly raised in posterior half to form arrowhead-shaped elevation (Figs 2E, F, 3C), its surface pubescent; cavities for reception of procoxae ended well before mesocoxae (Figs 2E, F, 3C). Each elytron with 10 punctate striae (Figs 1A, B, E, F, 3H), striae sharply impressed. Interval punctation consisting of setiferous punctures (Fig. 3G). Scutellar shield small, triangular.

Metathorax. Metaventrite moderately raised medially, forming a bare pentagonal area weakly projected anteriorly between mesocoxae (Figs 2E, 3F); lateral portions with coarse punctures, bearing fine hydrofuge pubescence (Fig. 2E). Anterolateral ridge absent; femoral lines absent (Fig. 2E). Metepisterna subparallel, ca 6.5× as long as wide. Hind wings well developed, ca 2.4× as long as wide; r-m-crossvein rising from base of radial cell; cubital spur rising from apex of M-Cu loop; m-crossvein vestigial; basal cell elongate, wedge cell absent; anal lobe weakly developed.

Legs. Coxae partly with hydrofuge pubescence, mesocoxae moderately separated (Fig. 2A). Femora with tibial grooves demarcated by ventral and dorsal ridges; ventral face of pro- and mesofemora glabrous, metafemora with fine microsculpture consisting of transverse lines. Tibiae weakly, gradually widened from base to apices, with fine and sparse lateral spines. Tarsi with five tarsomeres, with dense and short setae ventrally. Meso- and metatarsi with tarsomere 1 ca 2× as long as tarsomere 2 (Fig. 3E), tarsomere 5 slightly shorter than tarsomere 1; claws small and moderately curved (Fig. 3E).

Abdomen with five ventrites covered by fine hydrofuge pubescence; ventrite 1 2× as long as ventrite 2, strongly carinate throughout (Fig. 2A); posterior margin of ventrite 5 simply rounded, with an apical glabrous area. Aedeagus (Fig. 1C, G) of the *Cercyon* type, i.e. with median lobe reaching deeply into phallobase in natural position; parameres ca 2× as long as phallobase, with transversely bent apices; phallobase with asymmetrical basis (manubrium). Median part of sternite IX not reduced, forming a broad tongue-shaped structure (Fig. 1D, H).

Discussion. Hebauer (2002a) proposed *Himalcercyon* as a subgenus of *Cercyon*, mentioning that it corresponds to *Cercyon* in all characters except for the shape of the mesoventral plate. The form of the mesoventral elevation is one of most important generic characters in the Megasternini, and clearly differentiates both *Himalcercyon* species from all other members of the genus *Cercyon*. Both species of *Himalcercyon* are very similar to each other in all important characters and in the general form of male genitalia, indicating that they are likely closely related. Moreover, both species occur in the Himalayas. All of this supports *Himalcercyon* as a monophyletic clade that differs from *Cercyon*, as well as other megasternine genera, in the character currently considered as crucial at the generic level. For this reason, we elevate *Himalcercyon* to genus rank. See Diagnosis for the characters distinguishing *Himalcercyon* from other megasternine genera, and the identification key for a comparison of *Himalcercyon* with other Asian Megasternini.

Key to species of *Himalcercyon*

1 Body broadly oval, elytra combined 1.1× longer than wide (Fig. 1A). Prosternum widely carinate medially (Fig. 2C, D). Antennal groove weakly arcuate laterally (Fig. 2D). Mesoventral elevation wider, ca 1.5× as long as wide (Fig. 2E, F). Apex of the median lobe narrowly rounded, median lobe about as long as parameres and phallobase combined (Fig. 1C) .... *H. mirus* (Hebauer, 2002)

– Body moderately oval, elytra 1.3× longer than wide (Fig. 1E). Prosternum narrowly carinate medially (Fig. 3B). Antennal groove angulate laterally (Fig. 3B). Mesoventral elevation narrower, ca 2.0× as long as wide (Fig. 3C). Apex of median lobe pointed, median lobe shorter than parameres and phallobase combined (Fig. 1G) ..... *H. franzi* sp. nov.

Himalcercyon franzi sp. nov.

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Figures 1E–H, 3, 4

Type locality. China, Xizang Autonomous Region, Motuo County, track from Dayandong to Hanmi, 2200–2400 m a.s.l. [GPS ca 29.4283N, 95.0498E].

Material examined. Holotype: CHINA • 1 ♂; Xizang, Motuo County, Dayandong-Hanmi; 2200–2400 m a.s.l.; 13 Aug 2005, Tang Liang leg.; SYSU [verbatim label data: „CHINA, Xizang, Motuo Coun., Dayandong-Hanmi, alt. 2200–2400 m, 13.viii.2005, TANG Liang leg."].

Paratypes: CHINA • 9; same data as for holotype; SYSU • 4; Xizang, Motuo County, Nage-Dayandong; 2900–3300 m a.s.l.; 12 Aug 2005; Tang Liang lgt.; SYSU • 1; Xizang, Motuo County, Nage-Dayandong; 2900–3300 m a.s.l.; 12 Aug 2005; Tang Liang lgt.; NMPC.

Description. ***Form and color.*** Body size 2.5–2.8 mm (2.6 mm in holotype), body width 1.5–1.7 mm (1.55 mm

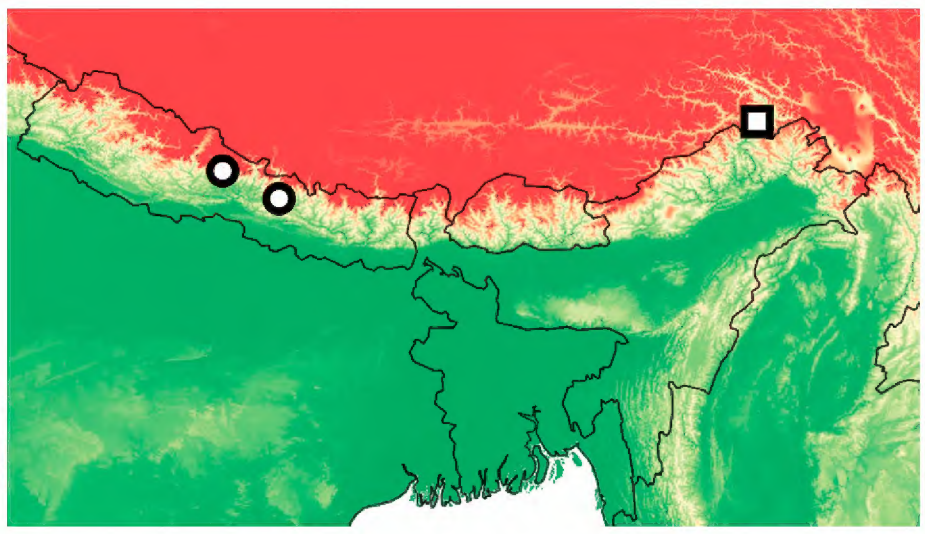

Figure 4. Known distribution of *Himalcercyon*: **Circles.** *H. mirus* (Hebauer); **Square.** *H. franzi* sp. nov. Color shading of the map indicated altitude: green = lowest, brown = highest.

in holotype), widest at anterior third of elytra, arcuately narrowing posteriad (Fig. 1E). Dorsum dark brown; head of some specimens with paler clypeus; pronotal lateral margins yellow brown; elytral apices and posterior half of lateral elytral margins slightly paler; epipleuron reddish brown; antenna, maxillary and labial palpi reddish brown; legs reddish brown, with darker femora.

Head. Clypeus with moderately dense fine setiferous punctures, smooth between punctures. Frons with punctures coarser and somewhat denser than those on clypeus, smooth between punctures. Mentum 2× wider than long, rugose, with dense coarse punctures (Fig. 3A), slightly concave anteriorly. Antenna with pedicel ca 0.2× as long as scape, pedicel ca. as long as antennomeres 3 and 4 combined, cupule small (Fig. 3D).

Thorax. Pronotum with punctation similar to that on frons, interstices without microsculpture; lateral marginal bead shortly overlapping to anterior margin but not to posterior margin, stopping at posterior angle. Scutellar shield smooth, with three to five punctures. Elytral striae sharply impressed (Figs 1E–F), striae 6, 8, and 9 not reaching base; intervals with much finer and sparser punctures than on pronotum, each interval puncture bearing a fine short seta (Fig. 3G), interstices between punctures smooth. Epipleuron with bare outer and pubescent inner portion delimited from each other by a fine ridge, inner pubescent part narrower than the outer part, reaching the level of posterior part of metaventrite. Mesoventral elevation arrowhead-shaped, ca 2.0× longer than wide, densely pubescent (Fig. 3C). Metaventrite with large median elevation, finely and sparsely punctate (Fig. 3F), interstices without microsculpture; lateral portions microsculptured with sparse coarse punctures and dense pubescence. Legs with trochanters densely pubescent, femora with sparse and moderately coarse punctures, interstice between punctures with fine microsculpture consisting of transverse lines.

Male genitalia. Middle lobe of abdominal sternite IX wide, shorter than lateral struts (Fig. 1H). Aedeagus (Fig. 1G) with median lobe ca 0.8× as long as tegmen; paramere ca 1.5× as long as phallobase. Paramere gradually narrowed from base to apex, truncate apically, widened inwards to form a process with a few setae. Median lobe broader than paramere, gradually narrowing in apical third, apex pointed, gonopore subapical.

Etymology. The species is named after Dr Franz Hebauer, a German taxonomist of the Hydrophiloidea who recognized and described *Himalcercyon* as a subgenus of *Cercyon*.

Distribution. Only known from the type locality in the eastern Himalaya (Motuo county, Xizang Autonomous Region, China) (Fig. 4).

Himalcercyon mirus (Hebauer, 2002), stat. nov.

Figures 1A–D, 2, 4

Cercyon (*Himalcercyon*) *mirus* Hebauer 2002: 39.

Type locality. Nepal, Kathmandu district, Sheopuri Mt., 2100–2300 m a.s.l. [GPS ca 27.816672N, 85.400000E].

Material examined. Holotype: NEPAL ● 1 ♂; Kathmandu Distr. Sheopuri Mt.; 2100–2300 m a.s.l.; 25 Jun 1988; W. Schawaller leg.; SMNS.

Paratypes: NEPAL ● 2 ♀♀; same data as for holotype; SMNS ● 1 ♀; same data as for holotype; NMPC ● 1 ♀; Annapurna, Telbrung Danda; 2600–2800 m a.s.l.; 13 Jun 1997; Schmidt leg.; SMNS.

Redescription. ***Form and color.*** Body size 3.1–3.5 mm (3.4 mm in holotype), body width 2.0–2.1 mm (2.0 mm in holotype), widest at anterior third of elytra, weakly narrowing posteriad (Fig. 1A). Dorsum pitchy-brown to black; head with paler clypeus; pronotal margins brown; elytral apices and posterior half of lateral elytral margins brownish; epipleuron pitchy brown laterally, reddish mesally; antenna, maxillary and labial palpi brown to reddish brown; legs reddish brown, with darker femora.

Head. Clypeus with moderately dense fine setiferous semicircular punctures, smooth between punctures. Frons with punctures of the same size and density as those on clypeus, smooth between punctures. Mentum 1.4× wider than long, rugose, with dense punctures (Fig. 2B), slightly concave anteriorly. Antenna with pedicel ca 0.2× as long as scape, pedicel ca. as long as antennomeres 3 and 4 combined, cupule small.

Thorax. Pronotum with punctation similar to that on frons, interstices without microsculpture; lateral marginal bead shortly overlapping to anterior margin but not to posterior margin, stopping at posterior angle. Scutellar shield smooth, with five to seven punctures. Elytral striae sharply impressed (Fig. 1A), striae 6, 8, and 9 not reaching base; intervals with finer and sparser punctures than on pronotum, each puncture bearing a fine short seta, interstices between punctures smooth. Epipleuron with bare outer and pubescent inner portion delimited from each other by a fine ridge, inner pubescent part narrower than the outer part, reaching the level of posterior

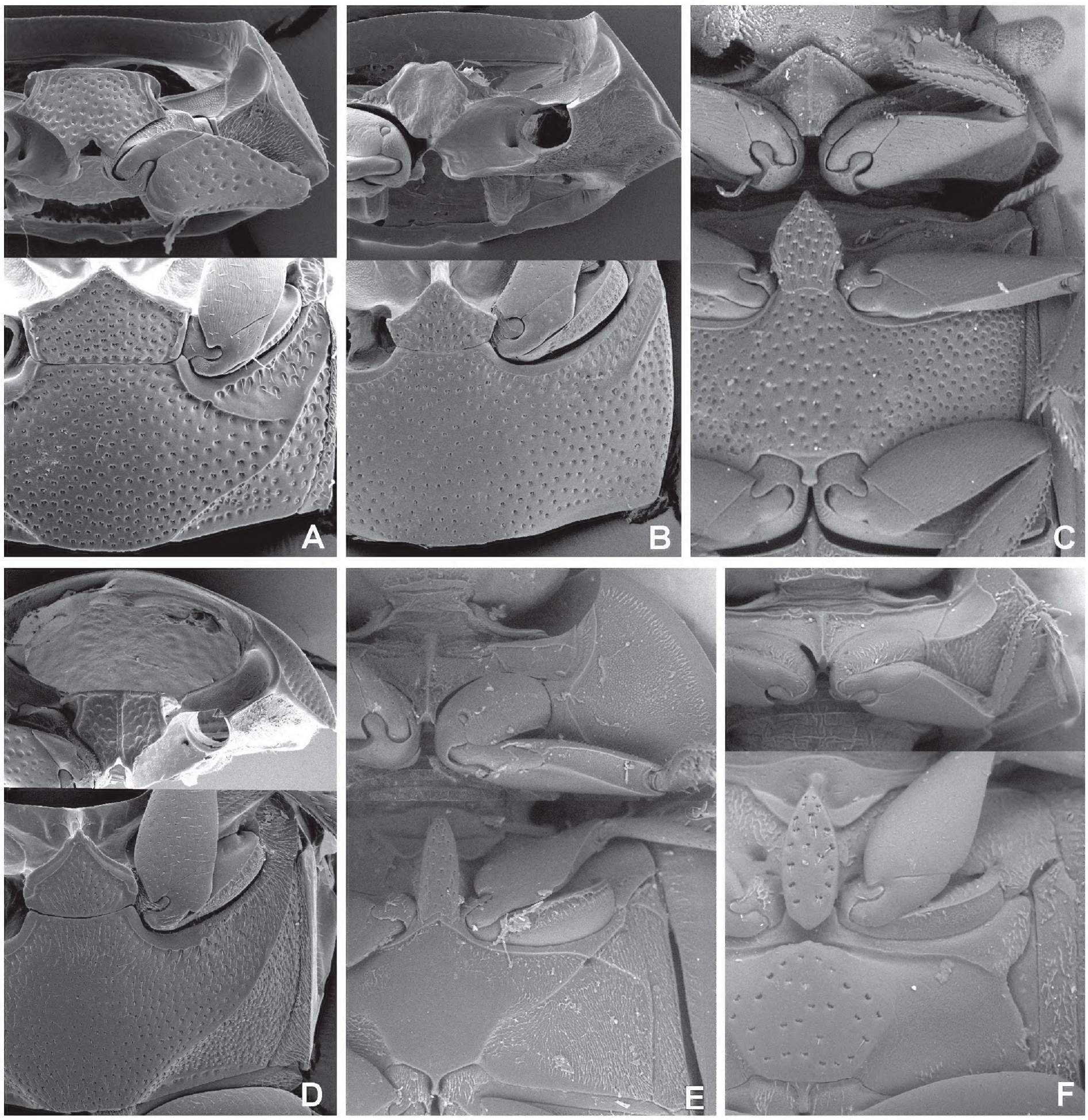

Figure 5. Ventral view of thorax of eastern Palaearctic and Oriental genera of the Megasternini. **A.** *Cryptopleurum ferrugineum*. **B.** *Megasternum concinnum*. **C.** *Pacrillum manchuricum*. **D.** *Pachysternum nigrovittatum*. **E.** *Peltocercyon coomani*. **F.** *Armostus schenklingi*.

part of metaventrite (Fig. 1A). Mesoventral elevation arrowhead-shaped, ca 1.5× longer than wide, sparsely pubescent (Fig. 2F). Metaventrite with large median elevation, finely and sparsely punctate (Fig. 2E), interstices without microsculpture; lateral portions microsculptured, with sparse coarse punctures and dense pubescence. Legs with trochanters densely pubescent, femora with sparse and moderately coarse punctures, interstice between punctures with fine microsculpture consisting of transverse lines.

Male genitalia. Middle lobe of abdominal sternite IX narrow, shorter than lateral struts (Fig. 1D). Aedeagus (Fig. 1C) with median lobe ca as long as tegmen; paramere ca 1.5× as long as phallobase. Paramere gradually narrowed from base to apex, obliquely truncate apically, widened inwards to form a process with a few setae. Median lobe ca as wide as paramere, gradually narrowing in apical third, apex narrowly rounded, gonopore subapical.

Distribution. Known from two localities in central Nepal (Fig. 4).

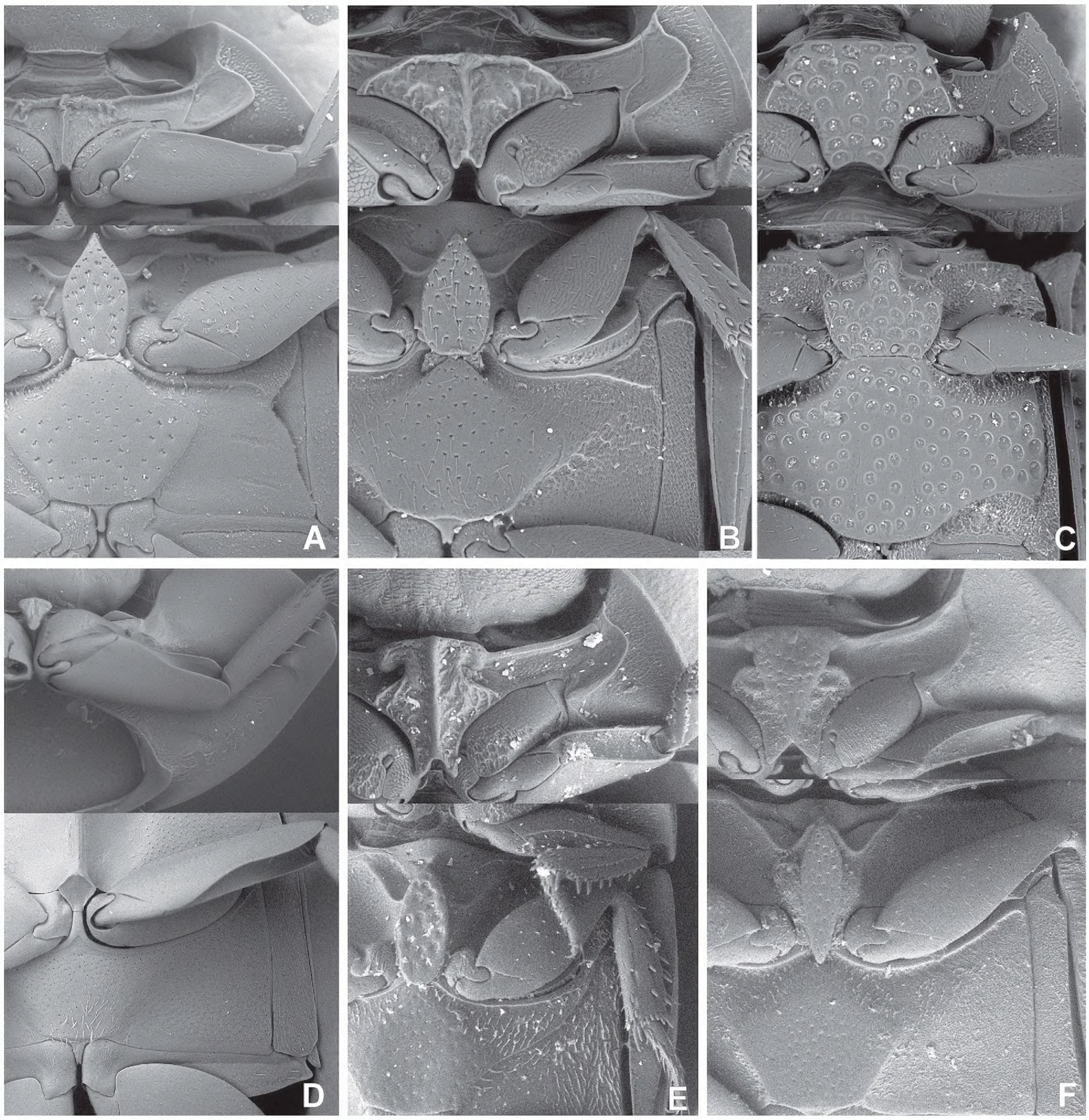

Figure 6. Ventral view of thorax of eastern Palaearctic and Oriental genera of the Megasternini. **A.** *Morastus gracilipalpis*. **B.** *Oosternum* sp. (*O. soricoides* group). **C.** *Emmidolium excavatum*. **D.** *Chimaerocyon shimadai*. **E.** *Paroosternum* sp. **F.** *Oreosternum frigidum*.

Key to Eastern Palaearctic and Oriental genera of the Megasternini

The following key is mainly based in the ventral characters, namely the form of prosternum and meso- and metaventrite, which are illustrated in Figures 5–8. The concept of some of the genera will likely be modified in the future; the key reflects the current status. The key includes all genera occurring east of Iran, the Black Sea, and the Ural Mountains. (i.e. it does not cover the Near East and the Arabian Peninsula); eastwards it includes all regions west of New Guinea. See Table 1 for the number of described species and references to the most important keys or taxonomic treatments for each genus. Remarks and numbers of species only refer to those from the Eastern Palaeartic and Oriental Regions.

1 Antennal grooves large, reaching to the lateral margin of hypomeron (Fig. 5A, B, D). 2
– Antennal grooves absent or small, not reaching to the lateral margin of the hypomeron (Figs 5E, F, 6, 7, 8A–C)..... 5

2 Metaventrite with complete femoral lines reaching from posteriomesal portion to anterolateral corner (Fig. 5A, D) 3
– Metaventrite without complete femoral lines, at most with short vestiges anterolaterally. (Fig. 5B, C)..... 4
3 Mesoventral plate wider than long. Prosternum with wide plate without median carina (Fig. 5A). Mentum with sharply pointed anterolateral corners (Fig. 8D) ..... *Cryptopleurum* Mulsant
– Mesoventral plate approximatley as long as wide. Prosternal plate approximately as long as wide, with more or less distinct median carina (Fig. 5D). Mentum with bluntly rounded anterolateral corners ..... *Pachysternum* Motschulsky
4 Median portion of prosternum roof-like, high (Fig. 5C). Mesoventral plate longer than wide. Metaventrite without any traces of femoral lines (Fig. 5C). Anterior tibia without anterolateral excision ..... *Pacrillum* d'Orchymont
– Median portion of prosternum with flat hexagonal plate, not carinate medially (Fig. 5B). Mesoventral plate slightly wider than long. Metaventrite with vestiges of femoral lines in anterolateral corners (Fig. 5B). Anterior tibia anterolaterally with emargination..... *Megasternum* Mulsant
5 Metaventrite with postcoxal ridge widely diverging from posterior margin of coxal cavity and forming an arcuate ridge reaching lateral margin of metaventrite (Figs 5E, F, 6A, B) 6
– Metaventrite with postcoxal ridge parallel to posterior margin of coxal cavity or nearly so, reaching anterolateral corner of metaventrite and not forming any arcuate ridge (Figs 6C–F, 7, 8A–C)..... 9
6 Metaventrite with complete femoral lines crossing the arcuate postcoxal ridge and X-shape in form (Fig. 5E). Mesoventral elevation narrowly elongate or narrow but widely contacting metaventrite ..... *Peltocercyon* d'Orchymont
– Metaventrite without X-shaped structure, femoral lines absent or short, not crossing with arcuate postcoxal ridge (Figs 5F, 6A, B)..... 7
7 Mesoventral plate widely contacting metaventrite (Fig. 6A, B). Median portion of prosternum at least weakly delimited from lateral portions 8
– Mesoventral plate separated from metaventrite by a wide deep gap (Fig. 5F). Median portion of prosternum simply carinate, not delimited from lateral portions..... *Armostus* Sharp
8 Metaventrite with deep triangular impression along its lateral margin (Fig. 6A)..... *Morastus* d'Orchymont
– Metaventrite without such impression (Fig. 6B)..... *Oosternum* Sharp
9 Median portion of prosternum highly elevated and/or delimited from lateral portions by sharp ridges (Figs 6C–F, 7A–D)...10
– Median portion of prosternum finely carinate, not delimited from lateral portions (Figs 7E, F, 8A, B)..... 18
10 Pronotum with deep longitudinal grooves (Fig. 8E). Bare portion of metaventrite very wide (Fig. 6C). Tiny beetles: length ca 1.2 mm ..... *Emmidolium* d'Orchymont
– Surface of pronotum without distinct longitudinal depressions. Bare portion of metaventrite confined to medial part only. Tiny to moderately large beetles 11
11 Median portion of prosternum in form of very small triangular, very highly elevated projection. Antennal grooves absent (Fig. 6D). Abdomen with apical emargination..... *Chimaerocyon* Fikáček, Maruyama, Vondráček & Short
– Median portion of prosternum never so tiny and not so highly elevated. Antennal grooves present, even though sometimes rather small. Abdomen never with apical emargination 12
12 Prosternal elevation with lateral margins deeply excised (Fig. 6E, F)..... 13
– Prosternal elevation with lateral margins or ridges straight (Fig. 7A–D) 14
13 Tiny species, 1.2–1.6 mm. Metaventrite with complete femoral lines (Fig. 6E). Antennal grooves present..... *Paroosternum* Scott
– Large species, ca 3.0 mm. Metaventrite without femoral lines (Fig. 6F). Antennal grooves absent .... *Oreosternum* nom. nov.
14 Elytral series deeply impressed with the impressions contiguous to anterior margin of each elytron (Fig. 8F, G). Mesoventral elevation longer than wide, rhomboid to suboval (Fig. 7A, B)..... 15
– Elytral series not impressed or impressions of elytral striae series not reaching anterior margin of each elytron. Mesoventral elevation elongate or as long as wide..... 16
15 Pronotum highly bulged in lateral view, not forming a continuous curve with elytra. Anterior margin of prosternal elevation strongly projecting anteriad (Fig. 7A). Mesoventral elevation subrhomboid ..... *Bolbonotum* Hansen
– Pronotum not highly bulged in lateral view, forming a continuous curve with elytra. Anterior margin of prosternal elevation straight (Fig. 7B). Mesoventral elevation suboval ..... *Kahanga* Hansen
16 Grooves for reception of procoxae ending far before the anterior margin of mesocoxal cavities (Fig. 8C). Mesoventral plate elongate ..... *Gillisius* d'Orchymont (part)*
– Grooves for reception of proxocae reaching nearly the mesocoxal cavities (Fig. 7C, D). Mesoventral elevation approximately as wide as long 17
17 Mesoventral elevation nearly semi-elliptical (Fig. 7C), with wide marginal rim. Postcoxal ridges on the metaventrite meeting mesally and forming a short median longitudinal ridge. Metatibiae densely pubescent ventrally (Fig. 8H). Large species: 2.5–3.3 mm..... *Australocyon* Hansen
– Mesoventral elevation more less pentagonal, without any marginal rim (Fig. 7D). Postcoxal ridges mesally bending posteriad, remaining separate, forming two short median longitudinal ridges (in one species largely obsolete). Metatibie without dense ventral pubescence. Medium sized to tiny species: 2.0–2.9 mm..... *Nipponocercyon* Satô

* the type species, *G. madurensis* d'Orchymont, 1925, keys out here.

18 Abdominal ventrite 1 without median carina. Mesoventral elevation narrowly laminar (Fig. 7E) ..... *Cycreon* d'Orchymont
– Abdominal ventrite 1 carinate medially. Mesoventral elevation in form of a lamina or an elongate plate 19
19 Ventral face of meso- and metatibiae with dense, long pubescence. Ventral morphology similar to Figure 7F ..... *Pilocnema* Hansen
– Ventral face of meso- and metatibiae never densely pubescent, at most with sparse short setae. Ventral morphology similar to Figures 2, 3, and 8A, B 20
20 Mesoventral elevation laminar or forming an oval elongate plate; posterior part of the plate rounded or acute (as in Fig. 8A, B) 21
– Mesoventral elevation elongate, but sharply cut off posteriorly, contacting metaventrite more or less in a straight line (as in Figs 2F, 8C) 22
21 Median portion of prosternum with a pair of transverse ridges partly delimiting prosternal process (Fig. 8A) ..... *Pseudocercyon* d'Orchymont
– Median portion of prosternum without such ridges, only simply carinate (Fig. 8B) ..... *Cercyon* Leach
22 Mesoventral elevation arrowhead-shaped, with lateral angulate lobes (Figs 2F, 3C) ..... *Himalcercyon* Hebauer
– Mesoventral elevation elongate oval (as in Fig. 8C); if small lateral lobes are present, they are below the plate 23
23 India, continental Southeast Asia and China. ..... *Gillisius* d'Orchymont (part)
– Islands of the Malay Archipelago. ..... *Pelosoma* Mulsant*

* the status of *Gillisius* and Asian *Pelosoma* is unclear.

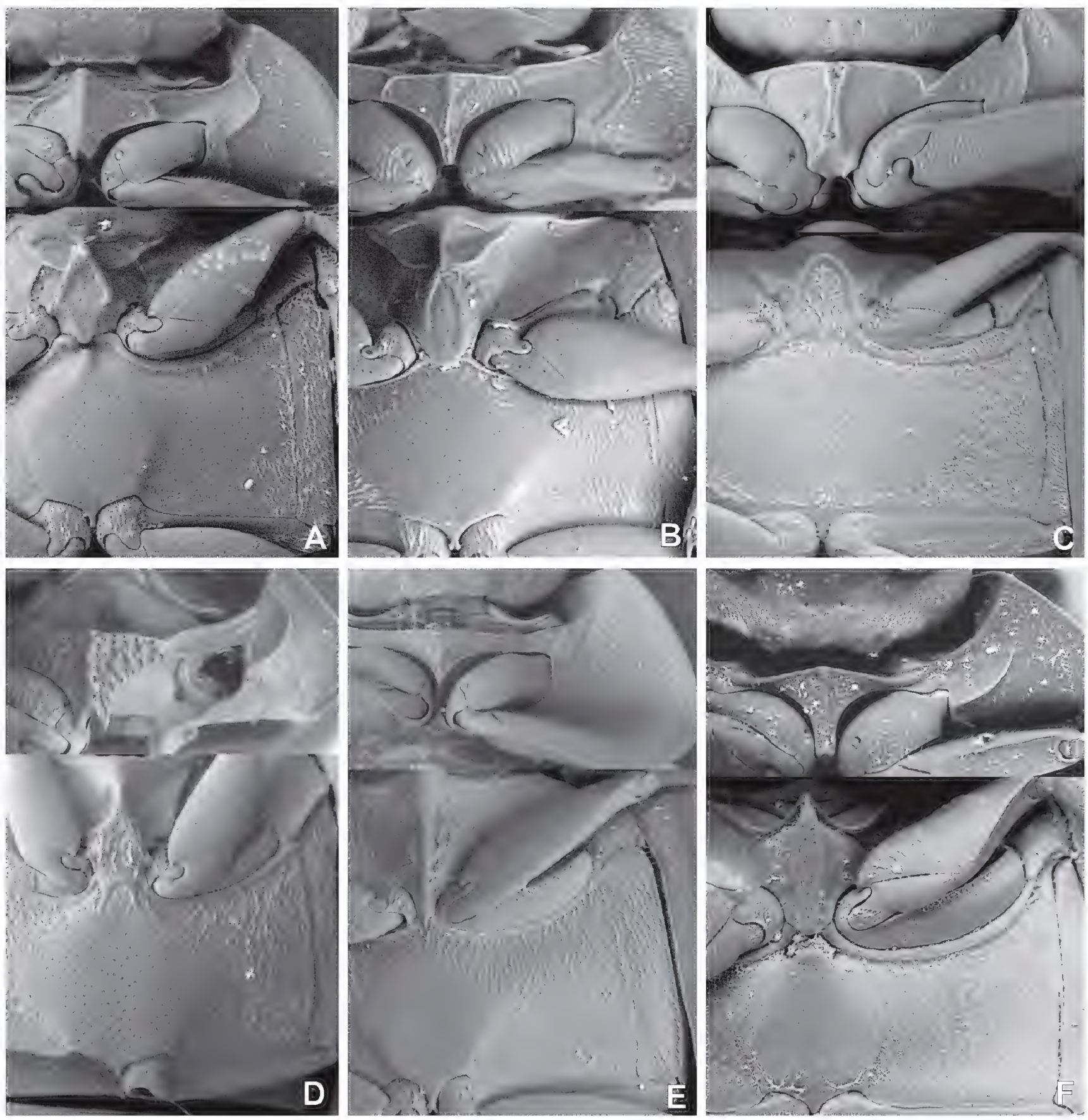

Figure 7. Ventral view of thorax of eastern Palaearctic and Oriental Megasternini. **A.** *Bolbonotum* sp. **B.** *Kahanga inconspicua*, holotype. **C.** *Australocyon* sp. (*A. pilocnemoides* group). **D.** *Nipponocercyon shibatai*. **E.** *Cycreon floricola*. **F.** *Pilocnema* sp.

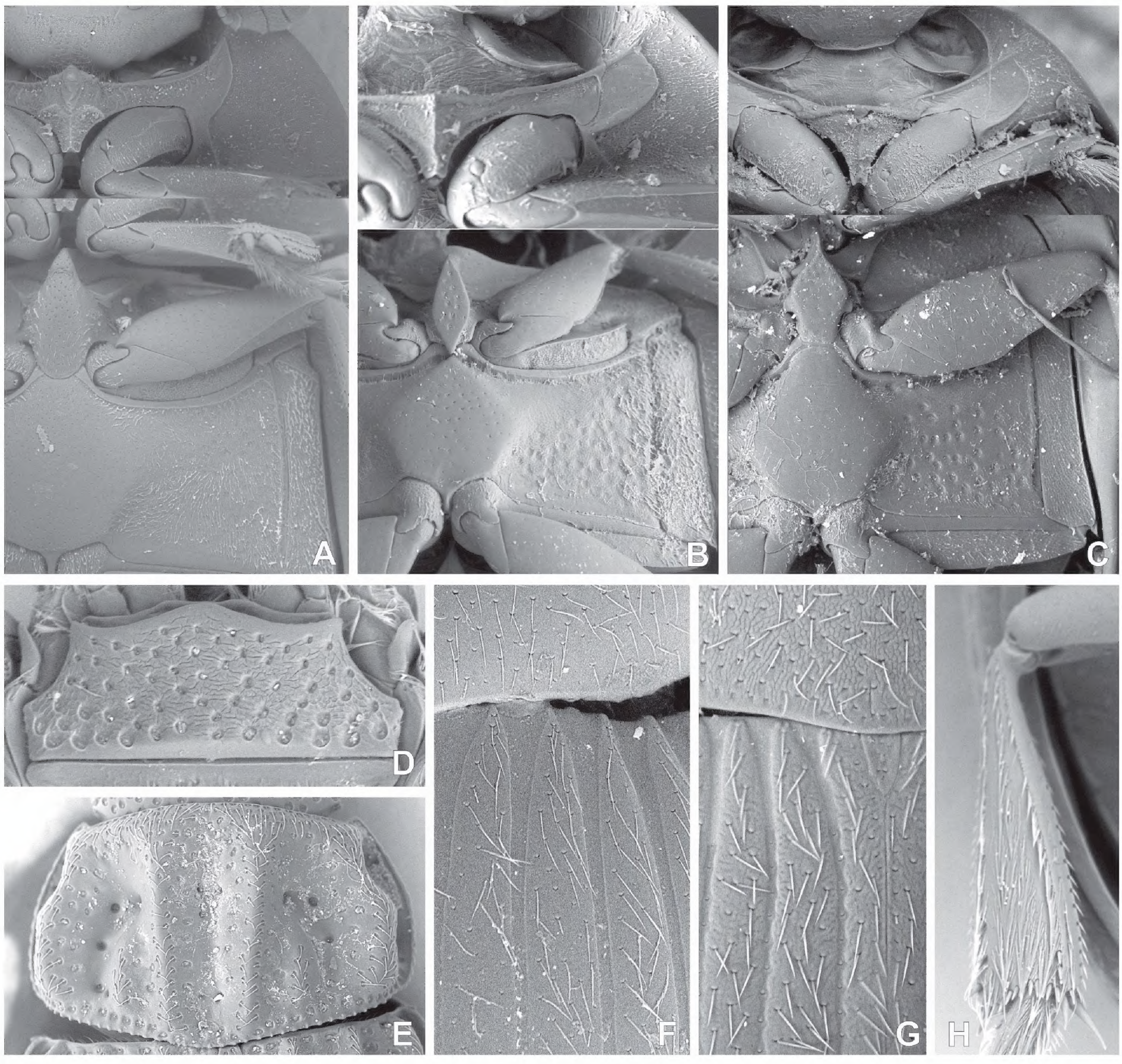

Figure 8. Ventral view of thorax and additional diagnostic characters of eastern Palaearctic and Oriental genera of the Megasternini. **A–C.** Ventral view: **A.** *Pseudocercyon andrewesi*. **B.** *Cercyon* sp. **C.** *Gillisius madurensis*, holotype. **D–H.** Other characters: **D.** *Cryptopleurum coomani*, mentum. **E.** *Emmidolium excavatum*, pronotum. **F.** *Bolbonotum* sp., base of elytra. **G.** *Kahanga inconspicua*, holotype, base of elytra. **H.** *Australocyon* sp. (*A. pilocnemoides* group), hind femur.

New replacement name

***Oreosternum* nom. nov.**

= *Oreocyon* Hebauer 2002a: 35 (not Marsh 1872: 406, not Krumbiegel 1949: 591).

Type species. *Oreocyon frigidus* Hebauer, 2002 (= *Oreosternum frigidum* comb. nov.)

Comments. While preparing the key, we noticed that the genus name *Oreocyon* is preoccupied by two older names: *Oreocyon* Marsh, 1872 (a fossil oxyaenid mammal, today a synonym of *Patriofelis* Leidy, 1872) and *Oreocyon* Krumbiegel, 1949 (a genus of Canidae described based on fur remains, later renamed to *Dasycyon* Krumbiegel, 1953 due to homonymy and today considered as a synonym of *Canis* Linnaeus, 1758). To avoid the homonymy, we are here proposing a new replacement name *Oreosternum* nom. nov. for *Oreocyon* Hebauer, 2002. The new name combines the prefix *oreo-* referring to mountains as used in the original name, and the core *sternum*, referring to the expected close relationship of this genus to *Paroosternum* Scott, 1913 exhibited by the prosternal morphology (see the key above). The new name is gender neutral.

Table 1. List of Eastern Palaearctic and Oriental general of the Megasternini, with number of described species and references to the most important keys or taxonomic treatments.

Genus	Described species	Keys or original descriptions
Armostus	11	d'Orchymont 1942; Hebauer 2002a; Hoshina and Satô 2006
Australocyon	7	Hansen 2003; Fikáček et al. 2012
Bolbonotum	3	Hansen 1999a
Cercyon	148	Shatrovskiy 1992; Hansen 1999b; Short and Hebauer 2006; Hoshina 2008; Jia et al. 2011; 2019; Ryndevich et al. 2017; 2019; Ryndevich and Prokin 2017
Chimaerocyon	2	Fikáček et al. 2013
Cryptopleurum	7	d'Orchymont 1926; Jia and Zhang 2017
Cycreon	4 + 1 ssp.	Arriaga-Varela et al. 2018b
Emmidolium	1	Fikáček 2007
Gillisius	2	d'Orchymont 1925a; 1926
Himalcercyon	2	this paper
Kahanga	1	Hansen 1999a
Megasternum	4	Shatrovskiy 1989; Fikáček et al. 2012; Ryndevich 2017
Morastus	1	d'Orchymont; 1926
Nipponocercyon	3	Hoshina and Fikáček 2010; Fikáček et al. 2012; 2015a
Oosternum	9	Hebauer 2002a; Hoshina and Satô 2004b; 2005
Oreosternum	1	Hebauer 2002
Pachysternum	11	Fikáček et al. 2012
Pacrillum	5	Hoshina and Satô 2004a; Fikáček and Hebauer 2005; Shatrovskiy 1989 as *Agnaeformia*
Paroosternum	5	Hebauer 2006
Pelosoma	2	d'Orchymont 1925b; 1932
Peltocercyon	4	d'Orchymont 1925a; Hoshina 2016; 2018
Pilocnema	1	Hansen 2003
Pseudocercyon	1	d'Orchymont 1926

Discussion

The genus-level systematics of the tribe Megasternini are currently based on the traditionally understood genera, defined by characters of the prosternum and meso- and metaventrite, i.e. structures which are morphologically very diverse within the clade. Following this approach, it is possible to define small and morphologically rather uniform genera for roughly half of the known species. On the other hand, the remaining half of megasternine species (i.e. ca 270 species) is assigned to the genus *Cercyon* Leach, 1817 as they are rather uniform in ventral characters. Eleven subgenera are defined inside of *Cercyon* to facilitate the identification of species, some of which seem to truly group related species (e.g., *Arcocercyon* Hebauer, 2003, *Paracycreon* d'Orchymont, 1942), but others very likely grouping unrelated species sharing a single derived character (e.g., *Acycreon* d'Orchymont, 1942; see Arriaga-Varela et al. 2018b). Preliminary molecular analyses (Short and Fikáček 2013, Arriaga-Varela unpubl. data) clearly indicate that *Cercyon* as currently circumscribed is a polyphyletic genus which needs to be reclassified in the future. To facilitate future analyses, it is necessary to reexamine *Cercyon* species and define groups of morphologically similar and likely closely related species. Selected representatives of these groups should later be included in the phylogenetic analysis. To that end, this paper recognizes *Himalcercyon* as such a group. The phylogenetic position of this clade needs to be tested in future analyses.

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